REMARKS

Claims 1-6, 8-16, and 18 remain in the application for consideration. Reconsideration of the claims is respectfully requested.

Claims 1, 5, and 13 stand rejected under 35 USC 102(b) as being anticipated by Peterson. Claim 1 is directed to a Hall Effect switch having two states, namely an actuated state and a non-actuated state. To this end, claim 1 recites a "a magnet carriage ... movable along a first longitudinal axis relative to said Hall effect sensor between a non-actuated position and an actuated position, said magnet carriage including a first magnet and a second magnet, said first and second magnets ... being in contact with each other...." Claim 1 further recites that "said Hall effect sensor [is] responsive to the positional displacement of said first and second magnets relative to said Hall effect sensor **such that said Hall effect switch transitions between a non-actuated state when the carriage is at its non-actuated position and an actuated state when the magnetic carriage is at its actuated position.**" (Emphasis added).

By contrast, Peterson is directed to "an electric actuator apparatus and, in particular, an apparatus for actuating vehicle all-wheel steering systems." (Col. 1, lines 5-8). As is explained in the Summary of the Invention section, the actuator of Peterson has a generally tubular housing enclosing an electric motor having a rotatable output shaft. A planetary gear set is enclosed in the housing and has an input attached to the output shaft and an output attached to a rotatable nut of a ball screw assembly enclosed in the housing. The screw of the ball screw assembly can be attached to a tie rod end for steering the rear wheels of a vehicle. A position sensor is mounted on the housing for sensing the position of the screw of the ball screw assembly along a path of

movement and generating a sensor signal representing that position (and hence of steering angle). The various embodiments described in Peterson use Hall Effect sensors to produce output signals indicative of the steering angle, e.g., signals having voltages that vary linearly with screw position.

> **Since the position of the tie rod end is representative of steering angle, a position feedback signal can be generated by sensing the linear travel of the ball screw 59 . . .** The actuator 68 includes a pair of longitudinally spaced apart magnets 71 and 72. Mounted on an outer surface of the cap 57 and extending over the cavity 67 are a pair of linear output Hall effect transducers 73 and 74 spaced apart along the longitudinal axis of the cavity. In FIG. 4, when the magnet 71 travels from the position shown toward the center of the transducer 73, **the transducer 73 will generate a sensor signal with an output voltage having a magnitude representing the distance traveled thereby indicating the distance the screw 59 has retracted the tie rod end 20 toward the actuator 14.** Conversely, when the magnet 72 is moved from the position shown toward the center of the transducer 74, **the transducer 74 will generate a sensor signal with an output voltage having a magnitude representing the distance moved thereby indicating the amount by which the screw 59 and the tie rod end 20 have been extended from the actuator 14.** (Peterson '861 patent, col. 6, lines 1-20, describing the position sensor used to sense steering angle in the embodiment of Figures 2-4).
>
> * * *
>
> A position sensor 93 is retained in a cavity formed in a generally cylindrical cap 94 extending into and attached to the open end of the housing 85. The position sensor is coupled to the rod 90 by a pin 94 which is free to move back and forth in a slot 96 formed in the interior wall of the cap 94 and the cavity. ... The position sensor 93 is shown in more detail in Figs. 8 and 9 as described below. However, the position sensor 93 can also be utilized with an alternate embodiment of the ball screw assembly. In FIG. 7, ... The position sensor 93 can be mechanically coupled as by a linkage 119 to the screw 112. As the linkage 119 moves back and forth in the direction of a double headed arrow 120, **the position sensor will generate signals representing the resulting steering angle.** As shown in FIGS. 8 and 9, a cavity 130 is formed in the cap 94 of FIGS. 5 and 6. Slideably retained in the cavity 130 is a magnet assembly 131 including a pair of magnets 132 and 133 ... The magnet assembly 131 slides in the cavity 130 past a pair of fixed opposed Hall effect transducers 134 and

> 135. **The opposite orientation of the magnetic poles of magnets 132 and 133 will generate opposite polarity similar magnitude signals from the transducers 134 and 135 which signals will indicate the direction and distance of movement of the magnet assembly 131 and thus the steering angle of any associated wheel.** (Peterson '861 patent, col. 6, line 38 to col. 7, line 50).

Peterson makes absolutely no mention of a Hall Effect switch of the type recited in claim 1. Rather, in order to operate in its intended manner, Peterson requires Hall Effect sensors that provide linear output signals representative of steering angle. Hence, Peterson fails to disclose or suggest a Hall effect switch comprising a "Hall effect sensor responsive to the positional displacement of said first and second magnets relative to said Hall effect sensor **such that said Hall effect switch transitions between an non-actuated state when the carriage is at is non-actuated position and an actuated state when the magnetic carriage is at its non-actuated position**" as recited in claim 1.

Claim 1 also requires that "said first and second magnets [be] in contact with each other." Applicants maintain that Peterson fails to disclose or suggest contacting magnets as recited by claim 1. To the contrary, Peterson repeatedly states that the magnets are spaced apart.

> A position sensor is mounted on the housing for sensing the position of the screw along a path of movement and generating a sensor signal representing that position ... **[T]he position sensor includes** a pair of Hall effect transducers mounted on the housing and spaced apart along the path and **a pair of spaced apart magnets** connected to the screw. (Peterson '561 patent, col. 2, lines 18-28).
>
> * * *
>
> A magnetic actuator 68 is slidably mounted in the cavity 67 and connected at one end to the threaded shaft 65 ... **The actuator 68 includes a pair of longitudinally spaced apart magnets 71 and 72.**

* * *

The actuator according to claim 2 wherein **said position sensor includes** a pair of spaced apart Hall effect transducers mounted on said housing and **a pair of spaced apart magnets** connected to said output shaft. (Peterson '861 patent, claim 3).

* * *

[A] position sensor mounted on said housing for sensing the position of said screw along a path of movement and generating a sensor signal representing said position, **said position sensor including** a pair of spaced apart Hall effect transducers mounted on said housing and **a pair of spaced apart magnets** connected to said shaft, each of said transducers being responsive to at least one of said magnets for generating said sensor signal as an output signal representing movement of said screw in an associated direction of travel along said path of movement. (Id. at claim 4).

* * *

[A] position sensor including a pair of spaced apart Hall effect transducers mounted on said housing and **a pair of spaced apart magnets** connected to said output shaft and positioned between said transducers, each of said magnets being associated with at least one of said transducers for generating an output signal from said associated transducer representing the position of said screw in at least one direction of movement along a path of movement. (Id. at claim 8).

In the embodiment shown in Figure 8 of Peterson, a gap is clearly present between the magnets 131 and 133. In describing this embodiment, Peterson states that the magnets "can be enclosed by a low friction material such as molded plastic." (Id. at col. 7, lines 33-35). The Examiner interprets "can" as teaching that the magnets can touch. Applicants contend, however, that given the clear showing of a gap in Figure 8 and the teaching of spaced magnets in the other embodiments of Peterson, this vague statement in Peterson does not teach the use of contacting magnets as

recited in claim 1. Rather, this statement in Peterson appears to be an attempt to avoid implying that a specific type of material, i.e., a low-friction material such as a molded plastic, is required by the Peterson patent. As is explained in the present application, placing the magnets in a contacting relationship, as recited in claim 1, provides a more precise switching point than would be achieved if the magnets were separated by some distance. (See p. 12, lines 12-15). The precise switching point achieved by the claimed invention allows the switch to be actuated by an extremely small displacement versus a switch in which the magnets are separated by a gap. (See p. 12, line 16 to p. 13, line 4). Peterson is not directed to a "switch." Instead Peterson uses the Hall effect sensors to detect linear position. As such, it makes sense that Peterson provides a gap between the magnets because separating the magnets may help to increase the region of linearity along the magnetic field, thereby allowing the Hall effect sensor to track with greater accuracy. Hence, claim 1 and its dependant claims 2-6 are patentable over Peterson.

Claim 13 is directed to a method of contactless switching in a switch housing including a Hall effect sensor and a magnet carriage. Claim 13 recites "mechanically displacing a magnet carriage along a first longitudinal axis, the magnet carriage having a first magnet and a second magnet ... **in contact with one another** ...; detecting the change in magnetic field due to the displacement of the first and second magnets ... with said Hall effect sensor; **actuating said switch based on the change in magnetic field detected** by said Hall effect sensor." Claim 16 is patentable over Peterson for the reasons given above in connection with claim 1. In particular, Peterson fails to disclose or suggest contacting magnets. Peterson also fails to disclose or suggest "actuating

said switch based on the change in magnetic filed detected by said Hall Effect sensor." Rather, the Hall Effect sensors in Peterson are used as feedback sensors to output a signal which is representative of the position of a movable member, i.e., of steering angle. Hence, claim 13 (and dependent claims 14, 15, 16 and 18) are patentable over Peterson.

Claim 14 is rejected under 35 USC 103(a) as being unpatentable over Peterson in view of Garneyer et al. Claim 14 depends form claim 13 and is patentable over Peterson for the reasons given above. Garneyer et al. fails to overcome the deficiencies of Peterson. Therefore, claim 14 is patentable over Garneyer et al. and Peterson.

Claim 1-3, 5-6, 13-15 and 18 are rejected under 35 USC 103(a) as being unpatentable over Garneyer et al. in view Peterson. Garneyer et al. teaches two permanently magnetized components 7_{a1}, 7_{a2} that are carried respectively, by two actuating members 3_{a1}, 3_{a2}. Garneyer et al. does not disclose or suggest that each of these magnets acts upon a single Hall effect sensor. Rather, each of the magnets operates on a respective pair of switching components (e.g., Hall effect sensors) so as to provide multiple switching points. In particular, the magnetized component 7_{a1} influences operation of switching components $8_{a1}'$ and $8_{a1}''$, whereas the magnetized component 7_{a2} influences operation of switching components $8_{a2}'$ and $8_{a2}''$. (Garneyer '728 patent, col. 2, line 64 to col. 3, line 9.) As such, each magnetized component 7_{a1}; 7_{a2}, in combination with its associated switching components $8_{a1}'$, $8_{a1}''$; $8_{a2}'$, $8_{a2}''$, provides multiple switching points. (Id. at col. 3, lines 36-66). Garneyer et al. does not disclose or suggest arranging the magnetic components 7_{a1}, 7_{a2} in a contacting relation

as recited in claims Claim 1-3, 5-6, 13-15 and 18. Nor does Garneyer et al. recognize that contacting magnets provide a more precise switching point. As was discussed above, Peterson also fails to address these issues. Therefore, claim 1-3, 5-6, 13-15 and 18 are patentable over Garneyer et al. combined with Peterson.

In view of the foregoing, it is respectfully submitted that the pending claims define allowable subject matter. If anything remains in order to place the present application in condition for allowance, the Examiner is invited to contact the undersigned at the telephone number listed below.

Respectfully submitted,

Date: February 11, 2003

By: _____
Kirk A. Vander Leest
Reg. No. 34,036
Attorney for Applicant

McANDREWS, HELD & MALLOY, LTD.
500 West Madison Street
Chicago, Illinois 60661
Telephone: (312) 775-8000